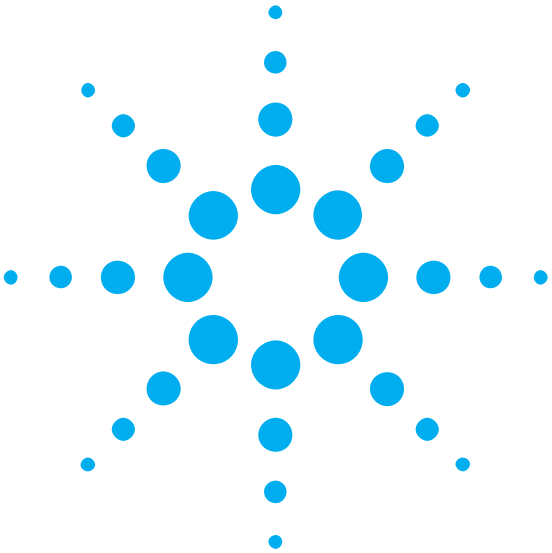

Getting Started
with the
Agilent J-BERT N4903B High-Performance Serial BERT

You only need a few minutes to get started with the J-BERT.

This Getting Started Brochure helps you to quickly understand the operating principles and to set up your first BER test.

If you need more detailed information on the N4903B, refer to the Online Help. The Help also offers printable versions of the User Guide and the Programming Guide.

Agilent Technologies

Notice

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Revision

Revision 10.0, January 2013
Manual Part Number
N4903-91011
Printed in Germany
Agilent Technologies, Deutschland GmbH
Herrenberger Str. 130
71034 Boeblingen, Germany

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ESD Sensitive Device

All front-panel connectors of N4903B are very sensitive to Electrostatic Discharge (ESD).
We urgently recommend to operate the instrument in an electrostatic safe environment.
There is a high risk of instrument damage causing expensive repairs when connecting a not fully discharged device or cable to a front-panel connectors or when touching a connector.
Please follow these instructions:
Before connecting any coaxial cable to the connectors, short the center and outer conductor with ground.
Before touching the front-panel connectors, discharge yourself by touching the properly grounded frame of the instrument.

Safety Summary

General Safety Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument.

Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

General

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

Environmental Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate within a temperature range of 5 – 40 °C (40 – 105 °F) at a maximum relative humidity of 95% and at altitudes of up to 2000 meters.

Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before Applying Power

Verify that all safety precautions are taken. The power cable inlet of the instrument serves as a device to disconnect from the mains in case of hazard. The instrument must be positioned so that the operator can easily access the power cable inlet. When the instrument is rack-mounted the rack must be provided with an easily accessible mains switch.

Ground the Instrument

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel.
Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Services and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center. You can find a list of local service representatives on the Web at:
http://www.agilent.com/find/techsupport

Installing the Agilent J-BERT

Inspect Shipment

Check if the J-BERT shipping container
contains the following standard deliverables:

Agilent J-Bert N4903B
High-Performance Serial BERT

If the contents are incomplete, if there is mechanical damage, or if the instrument does not work within its specifications, notify the nearest Agilent office. The Agilent office will arrange for repair or replacement without awaiting settlement.

For the complete content of your delivery please refer to the Box Contents List.

Power Cable

USB Cable

Agilent I/O Libraries Suite CDs

Getting Started Brochure

Box Contents List

Power Requirements

When the front panel switch is off, the instrument is in standby mode. The instrument can only be disconnected from the AC line power by disconnecting the power cord. The instrument must be positioned so that the operator can easily access the power cable inlet.

The instrument can operate from any single-phase AC power source supplying 100 – 240 V in the frequency range from 50 – 60 Hz. The maximum power consumption is 450 VA with all options installed. The power supply automatically adapts to the applied AC power (Auto Selection) and monitors the AC power range.

The mains plug can only be inserted in a socket outlet that provides protective earth contact. Any interruption of the protective earth contact inside or outside the instrument makes any operation of the instrument dangerous. Intentional interruption is prohibited.

Connections of the N4903B

1 If desired, connect a keyboard and mouse.
This is optional, the instrument can be operated without external input devices.

2 Connect the line cord.

3 Turn on the instrument.
If condensation has collected, it might be required to turn on the instrument several times until fully operational.

For all differential outputs of the PG: if only the normal or complement output is used in your test setup, the unused output must be terminated with 50 Ohm. The same is true for the differential inputs of the ED.
The ED CLK IN connector must be terminated with 50 Ohm when not used.

Please refer to the Online Help for detailed information about working with the instrument.

Allow a warm-up phase of 30 minutes prior to performing any measurements.

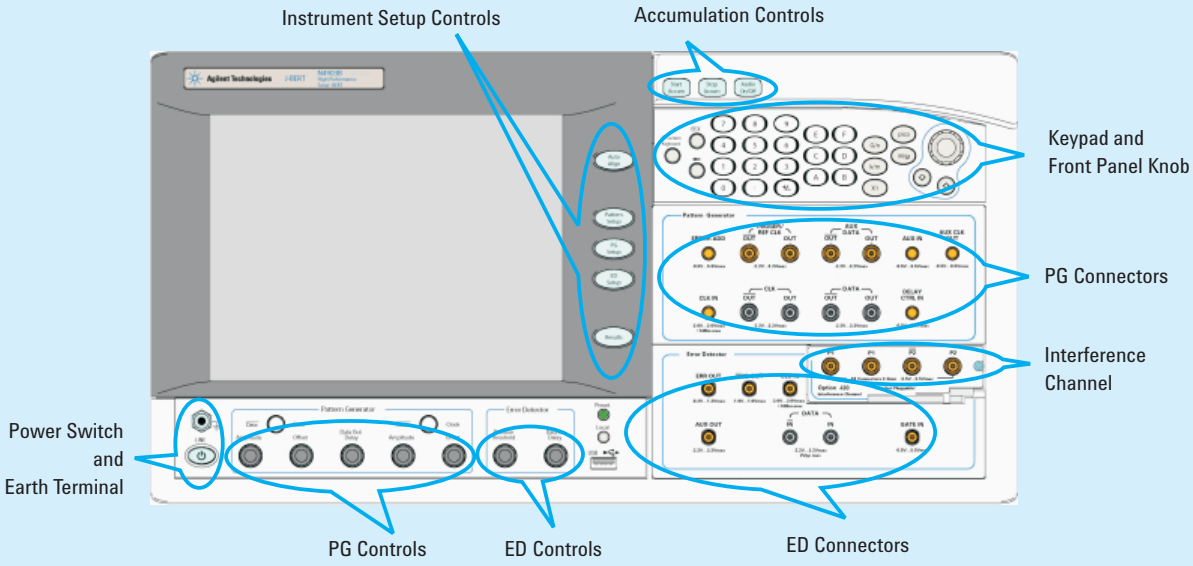
Ventilation Requirements

Make sure that there is adequate clearance of 50 mm (2 in) at the rear and right side of the instrument to ensure adequate air flow. If the air flow is restricted, the internal operating temperature will be higher, reducing the instrument's reliability.

Do not cover the ventilation holes.

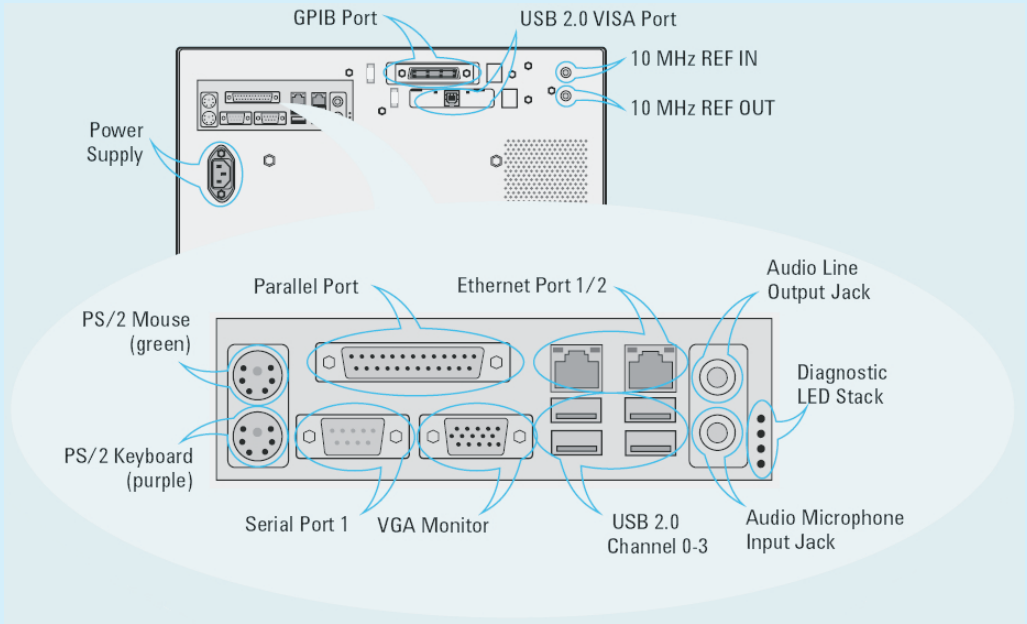
Operating the Agilent J-BERT

Now that the instrument is running, let's take a look at its front panel elements:



The Agilent J-BERT is available in different versions.
Depending on your version, some of the hardware and functionality described in this brochure may not be available.

The rear panel of the instrument provides the following connectors:



Caution

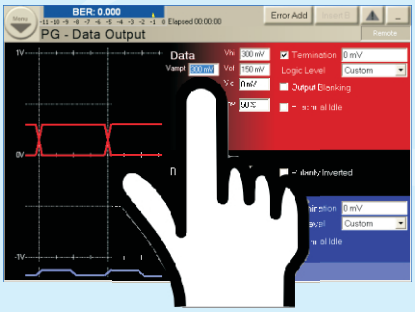
Never disable the LAN ports of the N4903B. Otherwise, you might lose the Agilent licenses (for example the J11 license option), which use the MAC address of the second LAN port for identification.
We recommend to use the Microsoft Windows Firewall to suppress network traffic over a LAN port instead of disabling the LAN port itself.

To avoid damage to the J-BERT and your devices under test, always use an ESD strap that is connected to the earth terminal.

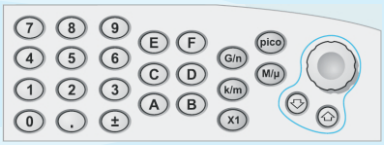
Operating the Agilent J-BERT

Changing Parameters

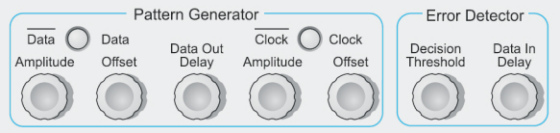
With the touchscreen, your finger is the mouse. Tipping an item with your finger is like clicking it with the mouse.



You can use the numeric keypad to enter values by hand, or the large knob to adjust values.



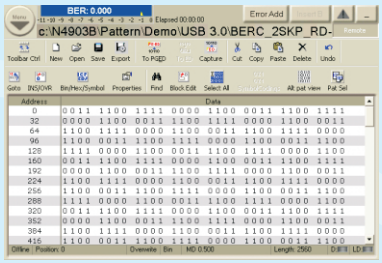
You can also use the knobs at the bottom of the instrument to change certain frequently used values at run-time.



Navigating the GUI

The menu buttons allow you to quicky navigate through the instrument's software sections:

Pattern Setup

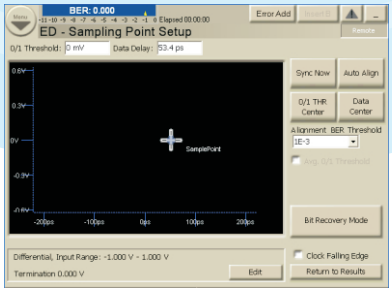


Toggle between pattern generator and error detector setup.

Analysis Results

Pattern Generator Setup

Error Detector Setup



Preparing the Test

What Are We Testing?

The quickest way to familiarize yourself with the instrument is to set up a short test. You can test the BER on a cable. All you need for this test is an APC/RPC cable for the data port connection and an APC/RPC-SMA adapter cable to connect the PG clock output to the ED clock input.

Setting up the Pattern Generator

First we need to set up the pattern generator. To keep things simple, let's set up LVDS logic levels for both the data and clock output.

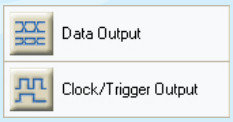
1 Reset the instrument.

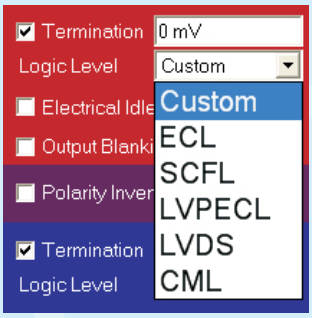
This sets all voltages and parameters to default values.

2 Use either navigation *Menu* or press the *PG Setup* button present on the instrument to switch to the *PG Setup*.

The pattern generator's output ports are always active. Therefore, you must be sure that your device can handle these ranges before you connect it.

3 Click *Data Output* for Data Output Setup, or click *Clock/Trigger Output* for Clock Output Setup.





4 Now select the logic family LVDS for the data and clock port.

You can change the output signal parameters according to the needs of your device.

5 Let's increase the signal's data offset by 100mV. Just tip the offset field.

6 Turn the fine-tuning knob until you have the desired value.

Use the Up and Down buttons below the knob to position the cursor.

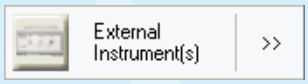
Setting up the Instrument

Setting up External Instruments

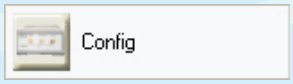
Now we can use the *External Instrument(s)* menu to configure externally connected instrument using the Serial BERT's GUI.

Ensure that the physical connection among the Serial BERT and the external instruments are properly done and then turn them on. Also ensure that we have properly installed the external instruments, for example N4916B.

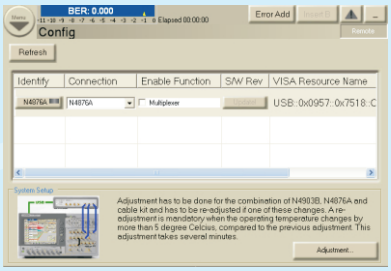
1 Switch to *External Insturment(s)*.



2 Select *Config*. This will open a *Config* window.



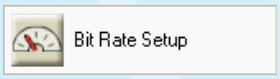
3 Use *Config* window to configure externally connected instruments.



Set the Bit Rate

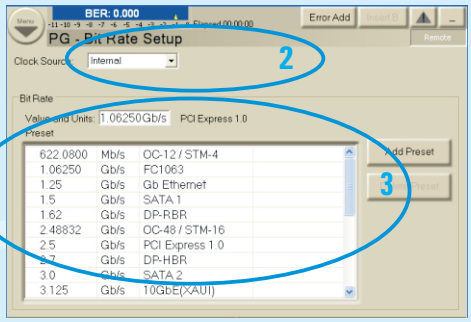
Now we want to set the pattern generator's bit rate. For now, we will use the instrument's internal clock:

1 Switch to the *Bit Rate Setup*.



2 Keep the *Internal Clock Source*.

3 Select *1.06250 Gb/s Ethernet* from the list.



You can easily add your favorite frequencies to the list.

Set the Pattern

Now select the data pattern to be used for the test:

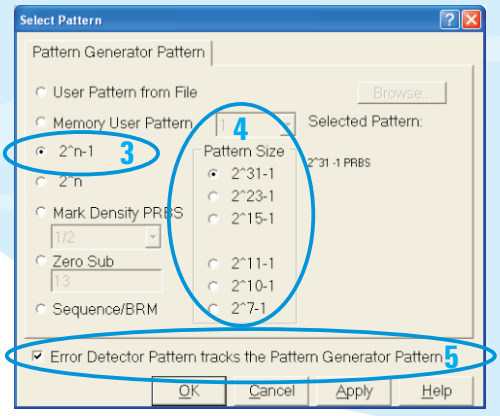
1 Press the *Pattern Setup* button to switch to the pattern editor.

2 Open the *Pattern Select* dialog box.

3 Select the pattern type *2^n-1 PRBS*.

4 Select the pattern size *2^31-1*.

5 The cable does not convert any data. Therefore, we use the same pattern for the pattern generator and the error detector.



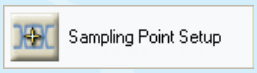
Besides generated patterns like PRBS, you can also use memory-based patterns. A large variety of useful test patterns is already provided, but you can also set up your own custom patterns. See the Help for details.

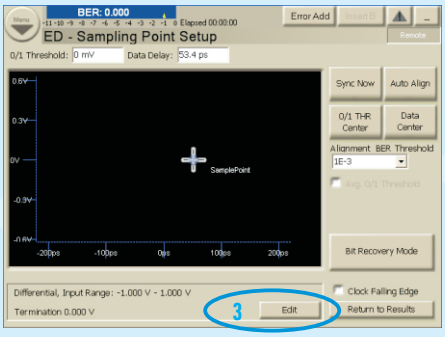
Setting up the Error Detector

The next step is to set up the error detector's inputs.

1 Press the *PG/ED button* twice to switch to the error detector setup.

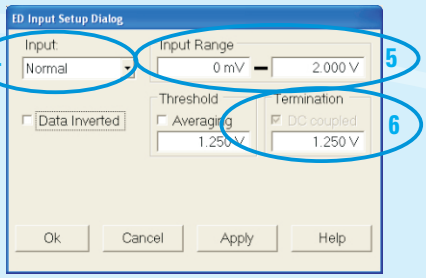
2 Switch to the *Sampling Point Setup*.





3 Click the *Edit* button.

4 Set the Input to *Normal*. This means, we need only one cable that will be connected between the pattern generator and the data input port.

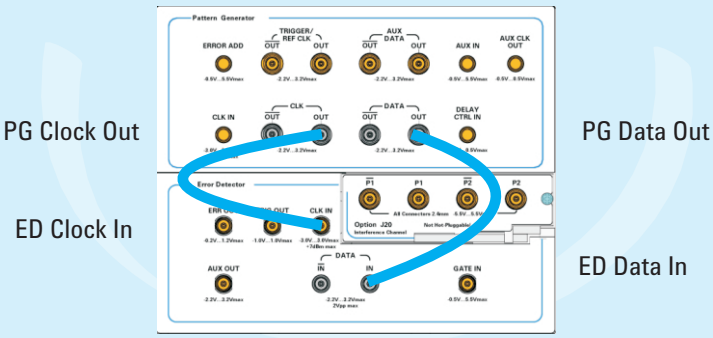


5 Set the *Input Range* so that it covers both the high and low voltage levels of the data signal.

6 Enter the termination voltage that matches the output termination of the DUT, in our case equal to the pattern generator's data output.

Connecting the DUT

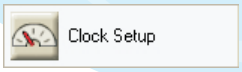
You can now connect the DUT. In our case you just have to connect the following ports:

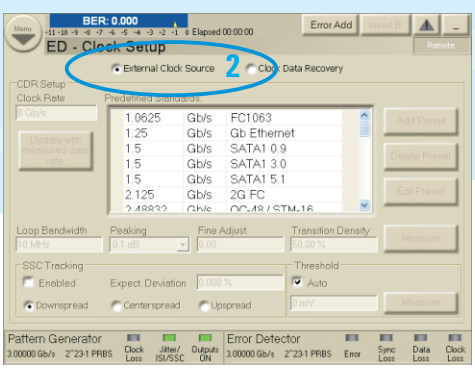


Defining the Clock

We have to make sure that the error detector uses the clock from the pattern generator:

1 Switch to the *Clock Setup*.





2 Select External Clock Source as the source for the clock signal.

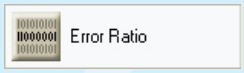
Setting up the Instrument

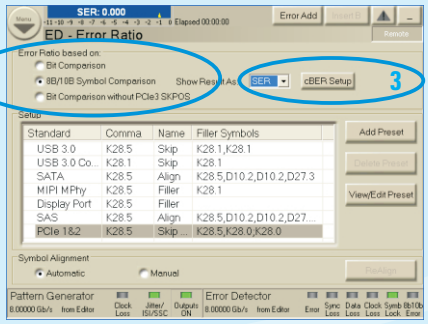
Selecting the Error Ratio Mode

Now you can select error ratio based on *Bit Comparison, 8B/10B Symbol Comparison,* or *Bit Comparison without PCIe3 SKPOS*.

Bit Comparison without PCIe3 SKPOS option is only applicable for PCI Express 3.0 Testing.

1 Open the *Error Ratio* window.





2 Select the error ratio mode from the provided options.

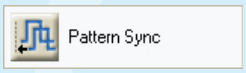
Before selecting the *8B/10B Symbol Comparison*, you must ensure to load the user patterns that contain valid 10B symbols.

3 If you select the error ratio based on *8B/10B Symbol Comparison*, use the drop-down list to specify whether you want to see the *8B/10B Symbol Comparison* results as SER/FER/cBER/FSR/DER/ISR.

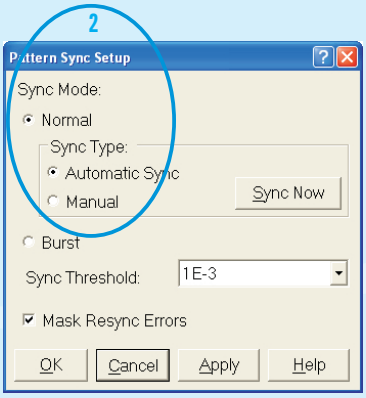
Synchronizing the Pattern

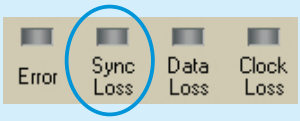
Now make sure that the error detector automatically syncs to the data pattern:

1 Open the *Pattern Sync Setup* dialog box.



2 Make sure that *Normal Sync Mode* and *Automatic Sync* are selected.





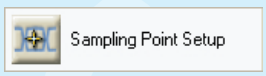
With this setting, the error detector starts synchronizing when the BER exceeds a certain threshold value. You can see when it has synchronized when the *Sync Loss* indicator goes off.

If sync fails, the sampling point is probably outside of the eye. You should proceed with setting the sampling point anyway. As soon as the instrument finds the eye, with the settings we just made, it will automatically synchronize the patterns.

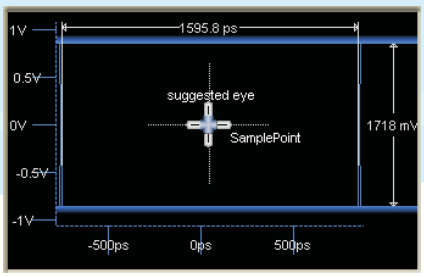
Setting the Sampling Point

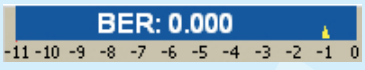
Now set the optimum sampling point:

1 Switch to the *Sampling Point Setup*.



2 Press the *Auto Align* button to measure the eye diagram and to position the sampling point at the center of the eye. This usually takes about 10 seconds.

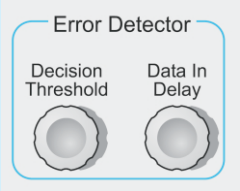




The BER indicator in the top left corner displays the current BER at this sampling point which should be 0 for this test.

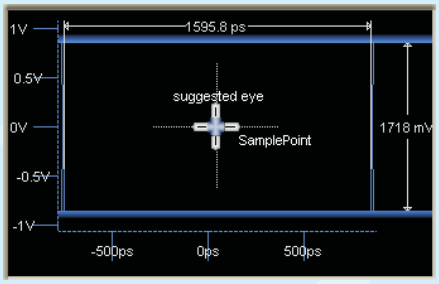
Adjusting the Sampling Point

You can adjust the sampling point manually, for example, to test the performance of your DUT closer to the edge of the eye.

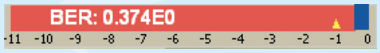


1 Use the *Decision Threshold* knob to move the sampling point vertically.

2 Use the *Data In Delay* knob to move the sampling point horizontally.



You can see how the BER increases when measuring at the edge of the eye.

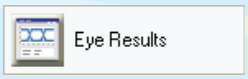


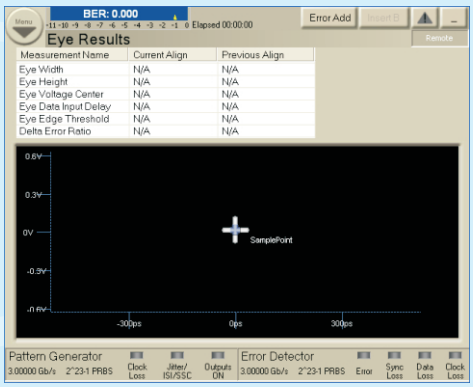
Viewing Eye Results

Now let's check the resulting eye:

1 Press the *Analysis Results* button twice to switch to the Results tab.

2 Switch to the *Eye Results*.



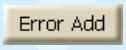


Here you can see the measured eye diagram along with all the important eye parameters. If you have done a measurement previously, these results are listed here too, for comparison.

Modifying the Test Setup

Inserting Errors

You can add a single bit error to the data stream by pressing the *Error Add* button.



The pattern generator can also be set up to insert a specified BER in the data stream. This can, for example, be used for testing error correction algorithms.

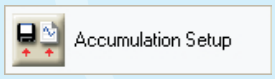
You could also loosen the data cable and wiggle it carefully. Watch how the BER changes.

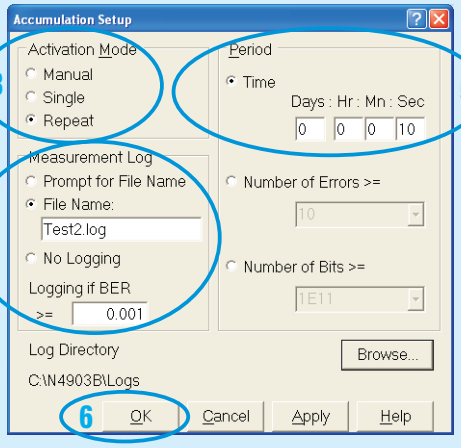
Setting up Error Accumulation

To provide comparable results, you can run tests over a longer time and collect the measured data:

1 Press the *PG/ED Setup* button twice to switch to the error detector setup.

2 Open the *Accumulation Setup* dialog box.





3 Select the activation mode *Repeat* to run repeated tests.

4 Select, No Logging, because we do not need a measurement log file now.

5 Select a *Time* of 10 seconds as the measurement period.

6 Press *OK*.

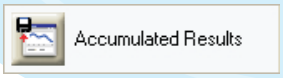
7 Press the *Start Accum* button to start accumulating.

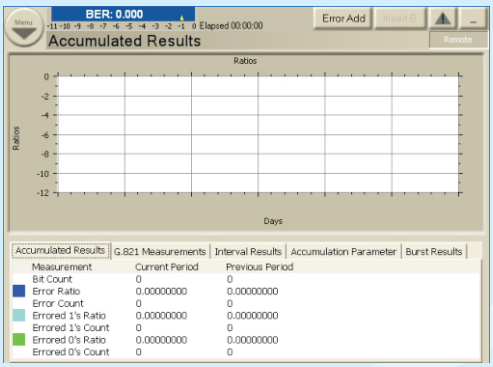
Accumulation Results

View the accumulated results:

1 Press the *Analysis Results* button twice to switch to the *Results* tab.

2 Switch to the *Accumulated Results*.





Here you can view all statistics measured during the current and the previous measurement.

To stop the J-BERT from collecting any more data, press the *Stop Accum* button.

Installing Hardware Options

Installing the J20 Option

To install the J20 Interface Channel:

1 Perform the regular shutdown procedure provided by the operating system.

2 Disconnect the instrument from mains.

Caution

Never plug in or remove a module while the instrument is connected to mains power.

3 Unscrew and remove the slot cover.

4 Insert the module into the slot.

5 Press the lever until the module rests firmly in place, the front plate aligned with the Error Detector's front panel.

6 Insert and tighten the fixing screw.

7 Power up the instrument. The software will automatically recognize the new component and provide the Interface Channel Icon and according setup functions in the *Jitter* window.

Connecting the J20 Option

The J20 Interface Channel has two ports, P1 and P2. They can be connected single-ended or differentially.

If you connect P1 to the Data Out of the Pattern Generator, P2 provides the output that is meant to be connected to the DUT.

If you connect P2 to the Data Out of the Pattern Generator, P1 provides the output.

Caution

The module has golden 2.4 mm connectors. Be sure to use the specific cables for the connection. Improper connection can damage the module.

How to Get Help

The J-BERT is equipped with a context-sensitive Online Help. There you will find comprehensive information on the basic concepts of the J-BERT, detailed procedures for operating it, and reference information on all elements of the GUI and the programming interface.

Agilent Corporate Information

For further product information, ordering information, and related literature, please refer to the website: